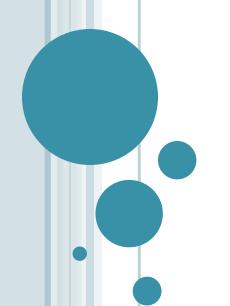
PAVLOVOLS, STEROLS UNIQUE TO THE GENUS *PAVLOVA*, ARE THE BIOACTIVE COMPOUNDS THAT INDUCE METAMORPHOSIS IN BAY SCALLOP PEDIVELIGERS FED CULTURED *PAVLOVA*



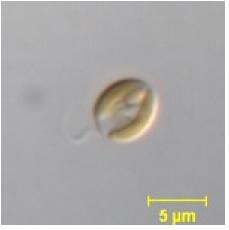
Derrick J. Chelikowsky, Diane Kapareiko, Dorothy Jeffress, Gary H. Wikfors (NOAA, NMFS, NEFSC, Milford, CT 06460), and José-L. Giner (SUNY College of Environmental Science and Forestry, Syracuse, NY 13210).

THE GENUS PAVLOVA

- Pavlova spp. have been used in bivalve larval feeding for many years (Ukeles, 1971)
- Pavlova spp. contain cholesterol that can fill the nutritional gap of T-ISO (Patterson et al, 1994)
- Currently part of the Family Pavlophycae
 - Formerly located in the prymnesiophycae
 - 3-4 strains are in use in both research and commercial shellfish hatcheries





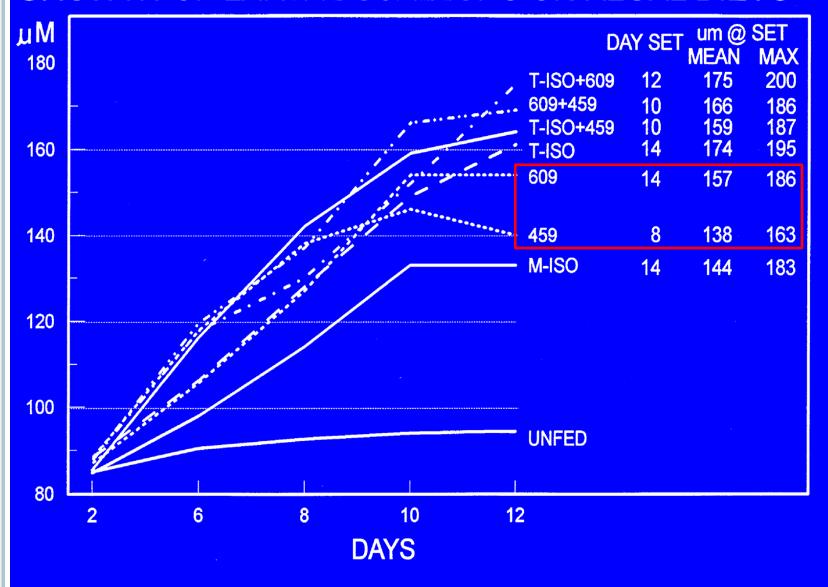


Previous Work

Jennifer Alix (1997)

- Published abstract on the setting of bay scallops (Argopecten irradians irradians) fed Pavlova strains
 - Set sooner and smaller with Pavlova in the diet

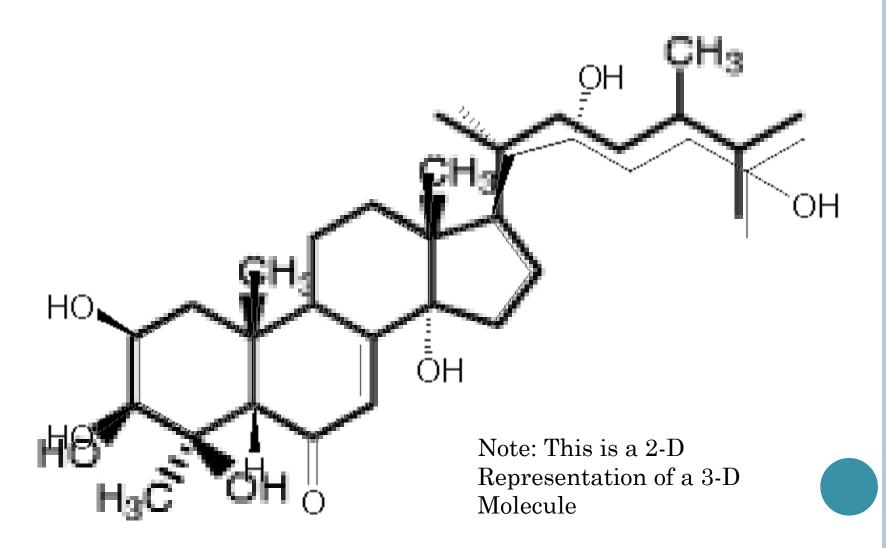
GROWTH OF LARVAL SCALLOPS ON ALGAL DIETS



HISTORY OF PAVLOVOLS

- Discovered in *Pavlova* species (Patterson et al, 1993)
- Structures of 4 molecules described (two shown)

MOLECULAR COMPARISON DR. GINER'S "AH-HAH!" MOMENT...

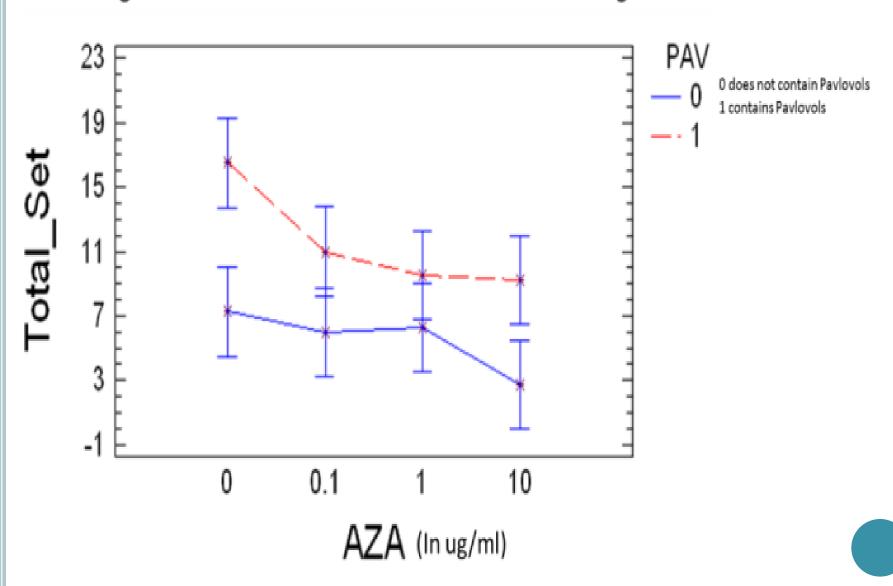


Previous Work

Chelikowsky, Kapareiko, Jeffress and Wikfors (2012)

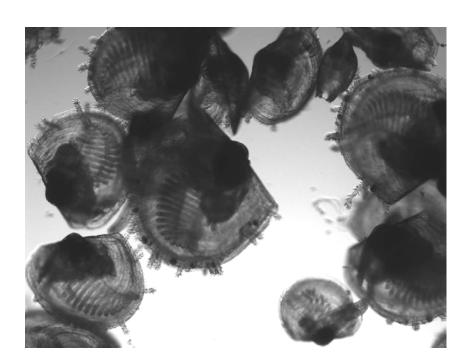
- Factorial Experiment designed to show if Pavlova is bioactive
- The addition of Pavlova sp. to the diets of larval bay scallops reduced setting time by 2 days
- Did not definitively show what was the bioactive compound

Figure 6: Effect of Pavlova and AZA on larval setting



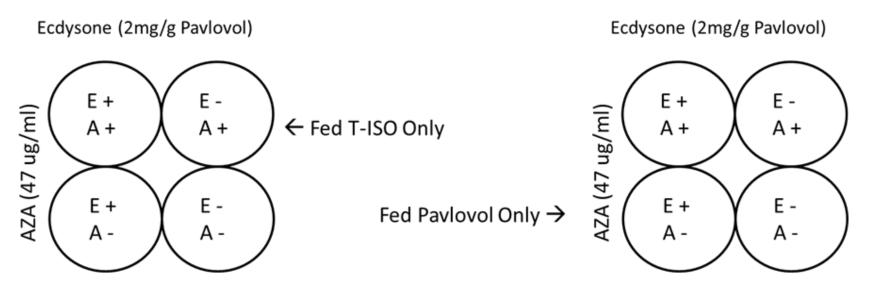
GOAL OF THE PRESENT EXPERIMENT

- To discover the bioactive compound inducing early metamorphosis of larval scallops fed *Pavlova* in previous experiments (Alix, 1997; Chelikowsky et al, 2012)
- To determine if the effects observed upon larvae are hormonal, nutritional, or both

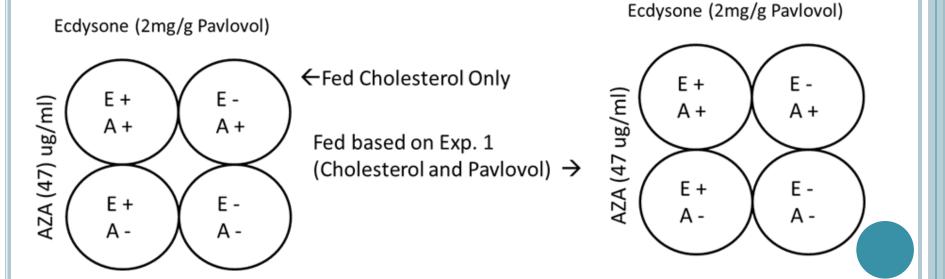


EXPERIMENTAL DESIGN

- A factorial design, similar to the one described by Chelikowsky, Kapareiko, Jeffress and Wikfors was chosen
- Use of synthetic cholesterol as a nutritional component
- Use of synthetic ecdysone as a hormonal component
- Use of synthetic pavlovol as an experimental component
- Use of Azadirachtin as an inhibitor of both ecdysone and *Pavlova* (previous findings)



All Treatments were fed T-Iso as a base diet

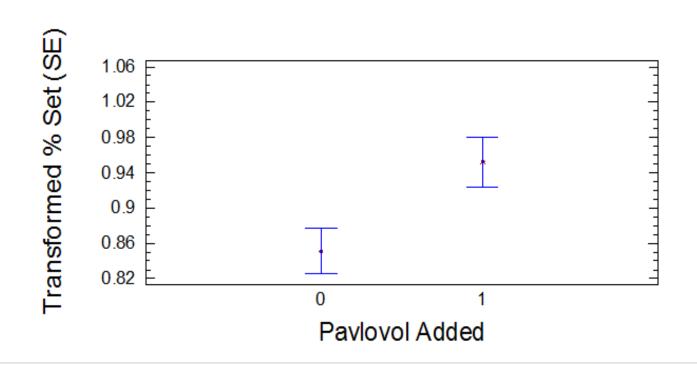


GENERAL PROCEDURE

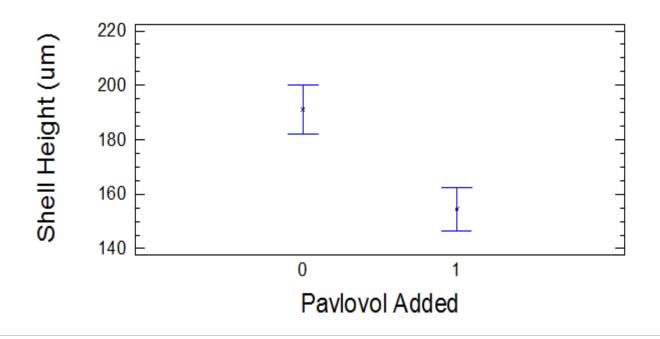
- Feed larvae daily according to established rations
- Add cholesterol, pavlovol, or both (quantity equal to the total sterol in T-ISO) to algal culture
- Add ecdysone and/or AZA according to treatment
- Count and measure larvae 3X/week
- Note day of first setting in each beaker



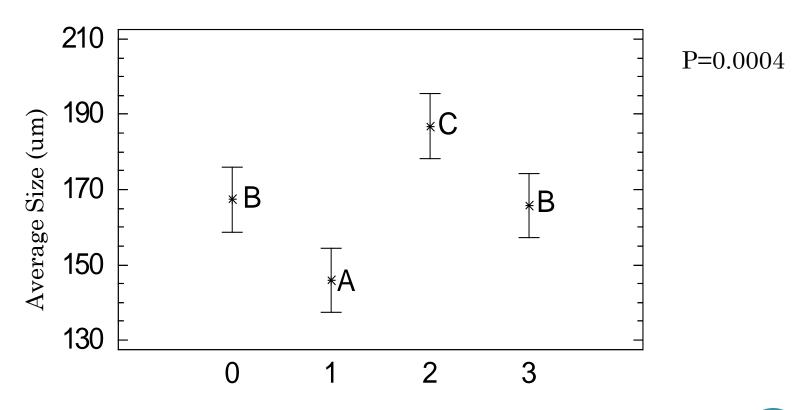
TRANSFORMED PERCENT SET (ARCSIN TRANSFORMATION) ON DAY 12



SIZE OF LARVAE ON DAY 12



SIZE COMPARISON AT DAY 12



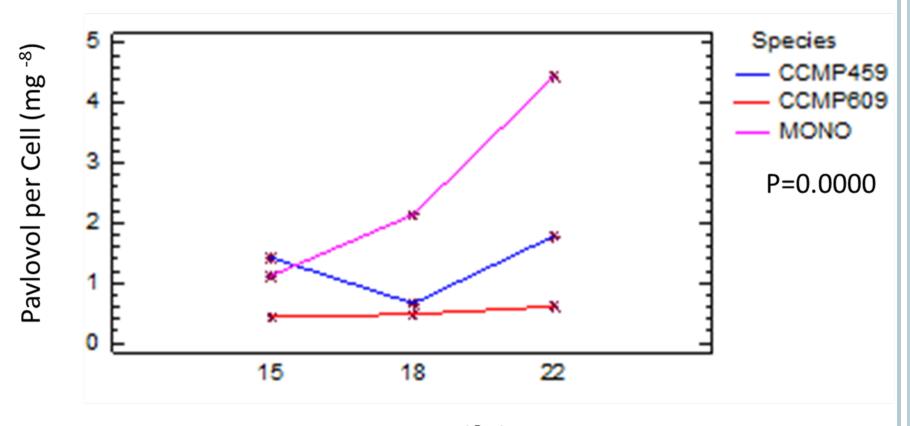
Diets: 0=T-Iso only 1=Pavlovol added 2=Cholestrol Added 3=Both Pavlovol, and Cholestrol added to T-Iso

RESULTS

- Scallop larvae fed T-ISO with synthetic pavlovol added set earlier at a smaller size than those not given pavlovol
- Larvae fed T-ISO with synthetic cholesterol grew larger than those not given cholesterol but did not set sooner
- Synthetic ecdysone induced early metamorphosis
- AZA blocked early setting, even when ecdysone or pavlovol was added

Pavlovol is an ecdysone analog in *Pavlova* strains that induces early setting!

IN CASE YOU WERE WONDERING WHICH PAVLOVA STRAIN HAS THE HIGHEST PAVLOVOL PRODUCTION ...



Temperature (°C) P=.001

CONCLUSIONS

- Ecdysone is a hormone apparently involved in metamorphosis of larval bay scallops! This was known for arthropods, but never before reported in a mollusk.
- The phytosterol pavlovol is a bioactive analog of ecdysone.
- Enriching a T-ISO diet with cholesterol improved larval scallop growth, but not setting. T-ISO is a nutritionally sterol-deficient diet for larval bay scallops.
- Feeding larvae *Pavlova* has both nutritional and hormonal effects.

FUTURE CONSIDERATIONS

- Long-term effects, past setting, remain unknown
- It is also unknown if this effect is seen in other bivalve species (oysters, clams)
- Optimization of quantity and timing of *Pavlova* feeding remains to be done.

ACKNOWLEDGEMENTS

- Dr. Chris Brown for the use of the Milford Laboratory facilities
- We would like to thank Mark Dixon for providing mass-cultured T-ISO
- Everyone at the Milford Lab for their support and Assistance

And thank you for your attention!

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- Ghosh, Parthasarathi. Patterson, G.W. Wikfors, G.H.(1998) Sterols of Some Marine Prymnesicophycae. Journal of Phycology 34. 511-514
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